From:	ANDERSON Jim M
To:	Eric Blischke/R10/USEPA/US@EPA; Chip Humphrey/R10/USEPA/US@EPA
Cc:	GAINER Tom; MCCLINCY Matt; POULSEN Mike; PETERSON Jenn L
Subject:	RE: Fate and Transport Modeling Update
Date:	04/01/2008 05:17 PM

Eric,
Thanks for putting this summary together. These types of summaries really help us prepare for the upcoming mtgs. At the end of your 3/27 e-mail, you ask for comments & thoughts. I added 1 thought in *italics underlined* font to the body of your e-mail below.

Jim

-----Original Message-----
From: Blischke.Eric@epamail.epa.gov [mailto:Blischke.Eric@epamail.epa.gov]
Sent: Thursday, March 27, 2008 11:09 AM
To: Shephard.Burt@epamail.epa.gov; Humphrey.Chip@epamail.epa.gov; Davoli.Dana@epamail.epa.gov; GAINER Tom; Grepo-Grove.Gina@epamail.epa.gov; PETERSON Jenn L; jeremy_buck@fws.gov; ANDERSON Jim M; Goulet.Joe@epamail.epa.gov; Smith.Judy@epamail.epa.gov; Koch.Kristine@epamail.epa.gov; MCCLINCY Matt; howp@critfc.org; POULSEN Mike; Fuentes.Rene@epamail.epa.gov; Robert.Neely@noaa.gov; Sheldrake.Sean@epamail.epa.gov; tomd@ctsi.nsn.us; csmith@parametrix.com; rgensemer@parametrix.com; rose@yakama.com; erin.madden@gmail.com; jay.field@noaa.gov; Cora.Lori@epamail.epa.gov; Ader.Mark@epamail.epa.gov; BBarquin@hk-law.com; audiehuber@ctuir.com; Lisa.Bluelake@grandronde.org; sheila@ridolfi.com; Benjamin Shorr; LavelleJM@cdm.com; Mary.Baker@noaa.gov; Michael.Karnosh@grandronde.org; FARRER David G; dallen@stratusconsulting.com; jpeers@stratusconsulting.com; (b) (6) ; Bob Dexter; cunninghame@gorge.net; JMalek@parametrix.com

Cc: Yamamoto.Deb@epamail.epa.gov; Cox.Michael@epamail.epa.gov
Subject: Fate and Transport Modeling Update

The purpose of this email is to summarize where we are at regarding the fate and transport modeling effort. We are scheduled to discuss certain elements of the fate and transport modeling with the LWG at our April 2, 2008 technical meeting. This meeting is scheduled to begin at 1:00 p.m. I have tried to summarize the discussion that took place on Monday and provide some clarity in response to yesterday's TCT discussion.

Background:

We have developed a hybrid model for the Portland Harbor site. The hybrid model links the hydrodynamic sedimentation transport (HST) model, the abiotic fate and transport (ABT) model and the food web model (FWM). The HST model looks at river flows in the Willamette River and uses modeled flow rates to predict sediment bed elevations. This model can be used to identify areas of sediment deposition and scour within the

Portland Harbor Study Area. The ABT model is a mechanistic model
(based on physio-chemical parmeters) that uses output from the HST model to look at future sediment and water concentrations. The ABT model can take into consideration The FWM takes the future sediment and water concentrations and used them to estimate future fish tissue levels.

The primary purpose of the hybrid model is to assist in the comparative evaluation of remedial action

alternatives. Other elements of the hybrid model will support other elements of the project. For example, the FWM portion will help with PRG development. The HST portion will help with identifying areas of scour and erosion. The ABT portion will support the development of the CSM in the RI.

As I mentioned during yesterday's TCT, we are scheduled to meet with the LWG to discuss technical issues associated with the fate and transport modeling effort. These include: The study area boundary and the impact on the modeling domain for the hybrid model, how to estimate incoming surface water concentrations based on the tentative upstream study area boundary of RM 11.8, and how to incorporate (or not incorporate) degradation into the fate and transport portion of the hybrid model. Some additional issues may come up as well.

Issues:

Below is a summary of the outstanding hybrid model issues as discussed during our meeting with the LWG at the end of January. These were further discussed during an internal technical call on Monday.

Estimating contribution of sediment to surface water chemical concentrations:

Estimating the contribution of sediment to surface water chemical concentrations is an important consideration for developing PRGs, assessing the effectiveness of source control efforts and developing loading estimates. Although we will use the food web model to help us with this, there are other tools available including the use of near bottom and near surface water data, sediment trap data, stormwater data and other loading data etc. In addition, we may be able to use the fate and transport model as a tool. For example, what happens if we set sediment concentrations to zero? What happens if we turn of the upstream or stormwater loads. Ultimately, there is no easy answer to this question and we will need to rely on a series of tools to "put the puzzle together." *While the FWM or BSAF maybe able to adequately evaluate the contribution of bioaccumulative chemicals in sediment to surface water..., & other tools such as "near bottom & near surface water data, sediment trap data, stormwater data & other loading data" are available…, none of these tools positively estimate the contribution of toxic COI (vs bioaccumulative COI) in sediment to surface water. One way of estimating the contribution of toxic COI in sediment to surface water chemical concentrations is to use EqP to estimate a pore water concentrations & then use loading or F&TM to estimate pore water flux to surface water. Unless we haven't all ready…, I think we need to clearly either: 1) direct to the LWG to estimate pore water concentrations at every sediment sample station based on sediment concentrations using EqP, or 2) advise them that we don't expect them to do this. I understand you think there are a number of reasons not to direct the LWG to do this including: this would be a large unexpected task that could have schedule implications; you're uncertain whether any other EPA projects have required RPs to screen pore water against WQSs, we have other LOE. I'm not certain we need to direct the LWG to use EqP to estimate pore water concentrations for the contribution of sediment to surface water, but it seems like an option. Furthermore, if the LWG doesn't estimate pore water concentrations at sediment stations, we maybe ignoring aggregate risk from COIs detected in multiple media. Are any of the TRVs we're working on sediment quality guidelines (SQGs) based on toxicity Water Quality Standards back-calculated using EqP to acceptable sediment concentrations?*

Chemicals to be modeled:

The food web model considers total PCBs, PCB TEQ, sum DDD, sum DDT, sum DDE, total DDT, Aldrin and dioxin TEQ. These are probably the only chemicals that we run the hybrid model for since we are really looking at linking with the food web model at the end. However, we will also be using the hybrid model to support the RI and the site CSM. In this instance, we will need to look at some additional "indicator chemicals." We will need to include some representative chemicals based on sources and physio-chemical properties. For example a key metal associated with stormwater discharges, a PAH, a phthalate, a organo-metallic, etc. We need to keep the list relatively small to keep it manageable.

Active Depth of Sediment Bed:

There are two different purposes of the model: Looking at long-term simulations and estimating the depth of maximum scour to support future use exposure scenarios and to support the FS., We agreed that 30 cm is a reasonable estimate to use for long term simulations but have requested that the LWG provide a justification for this depth. We recognize that the active depth will vary across the site and that high flow events may result in erosion deeper into the sediment bed. The 95% flow condition will be used to estimate maximum scour. We have told the LWG we need to estimate maximum scour (not net scour) to understand the level of subsurface contamination that is in play and areas subject to a high degree of scour from the perspective of the FS. The SedFlume measurements may be useful for this purpose. Revised model runs that incorporate the SedFlume measurements are expected sometime in April. We will need to review these to make sure it matches up with our expectations.

Sediment Burial Flux:

This issue is similar to the active depth of sediment be identified above. The issue that once sediment contamination is moved into the deep layer, it is removed from the system. Based on our understanding of sediment contamination distribution patterns and estimates of scour presented previously by the LWG, we know that this deeper contamination can be remobilized under certain conditions - chemicals that move into the deeper layer are not necessarily removed from the system but rather may be mobilized during high flow events. One approach we came up with is to run the long term simulation and then subject the sediment bed to a high flow event. We can then rerun the long term simulation with a new surface sediment layer.

Calibration parameters and Degradation Rates:

This is an issue that will come up on April 2nd. We discussed at length on Monday and during the TCT. The issue is two-fold: 1) How to address degradation; and 2) What should we use as a calibration factor. During the initial model run, the LWG used degradation (sediment half-life or HLS) as a calibration parameter. However, as Ben so astutely pointed out, the sediment data used to develop and calibrate the model was collected over a relatively short time interval (between November 2004 and September 2006 for water and October 2004 and March 2005 for sediments). Using HLS as a calibration factor, the LWG developed a sediment half-life for DDD of 100,000 days (300 years). Once external loads (sources) are fed into the model this values is expected to come down somewhat.

During Monday's technical discussion, we concluded that, given the spatial heterogeneity associated with the site sediment data, the October 2004 and March 2005 data was essentially collected at the same time. As a result, we do not believe that HLS should be used as a

calibration factor. However, the question came up: if we eliminate
sediment half life as a degradation rate, what should be use as a calibration factor? Earl Hayter felt that we need some parameter with which to calibrate the model. In a subsequent email exchange with Bruce Hope, Bruce offered the following advice given the purpose of the model (evaluate remedial action alternatives against one another in the FS):

"Why don't they just parameterize the model with measured values or literature values, make sure it's algorithms correctly represent physically credible processes, set the sediment concentrations at today's measured values, and let it run for 20 years? I really don't think you can do much else."

This was Ben's advice as well. However, if we take this approach, we need to come up with a sediment half life estimate or degradation rate. In our comments, we stated that we should assume "no degradation." However, we still need to put in a number. We can put in a very high number but I am concerned whether this is realistic. Ben felt that we should do a more thorough literature search and simply pick the best, appropriately conservative value. As I stated during our meeting, I believe that degradation rates are ultimately unknowable given the varying conditions across the site. However, given the purpose of the model, we should be a technically defensible value, insert in the model and

use the model as a tool to help us evaluate remedial action alternatives as well as other uses. It should be noted that the initial literature review identified 5 values of HLS (days) for DDE: 160, 1004, 3300, 4762 and no degradation. Using a value of 4762 days (approximately 13 years) may be a reasonable value to use for a 20 year model run.

Groundwater advection:

The issue of how to incorporate groundwater loading into the fate and transport model has come up. We basically need to provide the LWG with direction on this topic. My feeling is that, from a site-wide loading perspective, clean groundwater migrating through contaminated sediment and transporting those contaminants to surface sediments or the water column is a more significant migration pathway than dissolved contaminants impacting the benthic community on a localized basis. We will need to provide some direction to the LWG on how to develop groundwater loading estimates using a combination of groundwater flux estimates, sediment data and partitioning factors, TZW data and other lines of evidence. I will need some input from Rene and other hydros on this topic.

Study Area Boundary and Incoming Water Concentrations:

The Study boundary issue as raised some questions regarding the development of incoming water concentrations. I think we are going to have to figure out a way to use the data from RM 15 and assume that the water data are equally distributed across the river (i.e., assume no lateral stratification). The downside of this approach is that water impacts from sites like Zidell will not be taken into account. Since Zidell is expected to be remediated in the near-term, assuming no impacts from Zidell may be a reasonable assumption. In any event, we will need to document our assumptions. During the TCT, I stated that the data from RM 15 is generally lower than the data from RM 11. I have summarized a handful of results from the summer 2006 sampling event below.

Total As: RM 11E = 0.47; RM 11M = 0.46; RM 11W = 0.48; RM 15 Near Bottom (NB) = 0.41; RM 15 Near Surface (NS) = 0.42
Total Pb: RM 11E = 0.14; RM 11M = 0.13; RM 11W = 0.13; RM 15 NB = 0.098; RM 15 NS = 0.086
Total Cu: RM 11E = 1.1; RM 11M = 0.84; RM 11W = 1.0; RM 15 NB = 0.70; RM 15 NS = 0.68
Total Zn: RM 11E = 4.5; RM 11M = 3.2; RM 11W = 6.1; RM 15 NB = 2.4; RM 15 NS = 2.5

Total Congeners: RM 11E = 950; RM 11M = 279; RM 11W = 275; RM 15 NB = 174; RM 15 NS = 159
2,3,7,8-TCDD Homologs: RM 11E = 0.30; RM 11M = 0.24; RM 11W = 0.334; RM 15 NB = 0.27; RM 15 NS = 0.38
4,4-DDD: RM 11E = 0.041; RM 11M = 0.036; RM 11W = 0.046; RM 15 NB = 0.029; RM 15 NS = 0.027
BAP: RM 11E = 0.51; RM 11M = 0.27; RM 11W = 0.21; RM 15 NB = 0.16; RM 15 NS = 0.098

Based on these results, it is clear that for many chemicals, concentrations at RM 15 are less than those at RM 11. The exceptions to this are dioxin homologs and arsenic.

If anyone has any comments or thoughts on this email, please let me know. I would like to understand better our position on some of these elements prior to next Wedneday's meeting.

Thanks, Eric